

CHAPTER 30

SYNTAX AND PHONOLOGY IN L2 ATTRITION

Modularity and resilience

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30.1 INTRODUCTION

IN previous work, we demonstrated that most evidence in support of language loss is fundamentally lexical in nature, on a broad conception of the mental lexicon as containing items both below the word level, such as affixes, and above the word level, such as idioms and conventional expressions (Bardovi-Harlig & Stringer, 2013). On the assumption of Jackendoff's (1997, 2002) theory of Representational Modularity, open- and closed-class lexical items can be understood not as unitary entities but as links between syntactic, phonological, and semantic representations housed in distinct computational modules. Thus one possible understanding of the widely attested phenomenon of lexical attrition is that it involves not a fading away of individual items but a breakdown of correspondences between representations in a lexical network. This leaves open the possibility that certain modular aspects of syntax and phonology may be more resilient to attrition, as is occasionally hypothesized in the literature (e.g., Montrul, 2008, p. 192; Schmid, 2011a, pp. 53, 66–7). In this chapter, we ask to what degree syntax and phonology appear to be impervious to second language (L2) attrition and examine the related question of whether there is a critical period for either acquisition or attrition in these domains.

A second assumption underlying the current inquiry is that, in line with Schmid & Köpke (2017a), we believe that language transfer, or cross-linguistic influence (CLI), works both ways: just as first language (L1) knowledge affects the L2, given an appropriate level of activation, the L2 in turn affects L1 knowledge. This appears to be true not only in cases where the L2 becomes the dominant language, but in all cases of functional bilingualism, as an inherent characteristic of the bilingual condition (see also Kecskes & Papp, 2000; Cook, 2003a; Tsimplici et al., 2004). Moreover, despite the general age effects attested in both L2 acquisition (e.g., Johnson & Newport, 1989) and L1 attrition (e.g., Bylund, 2009b), the effects of CLI can be attested irrespective of any purported critical period, as shown in

studies of phonological perception (e.g., Bosch & Sebastián-Gallés, 2003) and syntax (e.g., Unsworth, 2013). This lends credence to the position that CLI in bilingualism may be characterized irrespective of the age of acquisition and the L1/L2 distinction. Therefore, we draw on both the more comprehensive L1 attrition literature as well as the more sporadic research on child and adult L2 attrition in order to shed light on this L2 investigation.

Regarding the possibility of a critical period relevant to both L2 acquisition and L1/L2 attrition, we take as our point of departure Montrul's (2008) suggestion that the crucial juncture in development might be around 8 to 10 years old. Montrul illustrates this graphically as the intersection of a downward line showing decline in target-like L2 acquisition, and an upward line showing L1 retention (and presumably child L2 retention) in cases of a shift to a new dominant language.¹ She describes this intersection as 'the approximate age at which, hypothetically, the linguistic capacity for language, or the L1 in monolingual acquisition, is about to reach, or has reached, its mature and steady state' (p. 266), and suggests that this crystallization of the L1 may result in a subsequent disabling of the capacity for L2 acquisition, as well as marking the end of the period of vulnerability to L1 loss.

In the next section, we briefly examine evidence for and against critical periods in L2 acquisition and in L1/L2 attrition. We then evaluate findings on the proposed resilience of phonology and syntax in cases of L1 attrition. This serves as a foundation for our examination of L2 attrition studies. To anticipate our conclusions: we find that the question of whether grammar is resilient to attrition following a critical period must be asked separately of phonology and syntax. Regarding phonology, there are indeed cases of amazing resilience that flatly contradict the idea of a critical period for attrition. However, both L1 and L2 phonological systems are subject to CLI in cases of cross-linguistic similarity. As for syntax, it proves more difficult to argue for resilience in the absence of CLI, as neither comprehension nor production of syntax can be examined independently of lexical retrieval and the real time constraints of working memory. Our pursuit of these questions leads us to suspect that something may indeed occur around 8 to 10 years old involving non-modular knowledge, with dramatic effects on the language system, namely network stabilization of the mental lexicon.

30.2 CRITICAL PERIODS IN ACQUISITION AND ATTRITION

Montrul's (2008) suggestion of a common developmental phenomenon in middle childhood changing the course of both L2 acquisition and L1/L2 attrition emerges from independent observations in both domains of research. On one hand, several L2 acquisition researchers have proposed that convergence on native-like knowledge of the L2 is possible only until age 8 to 10, after which there is an inexorable decline in potential (Coppieters, 1987; Johnson & Newport, 1989). On the other hand, studies of L1 attrition in adoptees have

¹ The second, solid line in Montrul's (2008, p. 267) graph is labelled in the original as *L1 loss*; however, we interpret this as referring to *L1 retention*, as the y-axis measures proficiency.

shown the possibility of complete loss of ability to process the L1 if attrition sets in before precisely this same age-range (Nicoladis & Grabois, 2002; Pallier et al., 2003), even though complete convergence on the L2 is not guaranteed (Norrman et al., 2016; see also Pierce et al., Chapter 38, this volume). While research on L2 attrition before the proposed critical period is minimal, one of the authors also has first-hand anecdotal evidence for the extraordinary effects of early L2 attrition. David Stringer's eldest daughter, Tamsin, was Japanese-dominant at age 6, after four years of daily immersion in Japanese-only environments outside the home in a rural Japanese community. Japanese was the only language of communication with peers, and the preferred language of play with siblings and of self-talk; school teachers considered her Japanese to be native-like. Yet after just three months of complete absence of input following her arrival in the US (a linguistic transition similar to that experienced by adoptees), syntactic production started to breakdown, and after six months, there was no comprehension of even simple sentences. To all appearances, an entire dominant language had disappeared at age 6, in just six months.

Montrul's (2008) attempt to link these patterns in acquisition and attrition is conceptually attractive. Perhaps there is a critical period when L2 acquisition comes easily but during which reduced L1 or L2 input can be catastrophic, and after which acquisition of further languages is compromised (Montrul, 2008, pp. 262–8). However, this conceptually neat scenario involves considerable simplification and is only plausible if we consider language holistically. It is worth pausing to consider separately patterns of L2 acquisition of phonology and syntax.

No phonologist has ever suggested that a critical period for L2 phonological acquisition closes at 8 to 10 years old. Several researchers have argued that capacity for phonological acquisition remains the same in adulthood, and that difficulties arise only in cases of cross-linguistic similarity (e.g., Flege, 2003; Iverson et al., 2003). Native-like L2 phonology has been reported for both aspects of perception (e.g., Werker & Tees, 2005; Darcy et al., 2007) and production (e.g., Bongaerts, 1999; Flege et al., 2002). Moreover, CLI effects in phonology have been found well in advance of any suggested critical period: there are unambiguous interference effects in simultaneous bilinguals from at least 8 months old (Bosch & Sebastián-Gallés, 2003).

As for syntax, researchers have variously suggested that acquisition becomes compromised at around 4 (Meisel, 2009) to 7 years old (Johnson & Newport, 1989). However, the evidence for a critical period in syntax is somewhat thin. When the data from behavioural studies indicating dramatic decline are disaggregated, age effects tend to disappear (Birdsong & Molis, 2001); conversely, other studies show native-like attainment for some learners (e.g., White & Genesee, 1996; Montrul & Slabakova, 2003). Moreover, there is no actual evidence from studies of brain imaging, cognitive ageing, brain volume, or dopamine systems that the brain is subject to a critical period for language acquisition (see Birdsong, 2006, for a review).

Rather than there being a biological critical period for syntax, it seems more plausible to consider age in L2 acquisition as a 'macro-variable' (Montrul, 2008, p. 50), with well-recognized general age effects due to other confounding factors, such as quantity and quality of input and frequency of use of the L1 and L2. When Unsworth (2013) carefully controlled for input factors in groups of children acquiring gender agreement in Dutch, differences between monolinguals, simultaneous bilinguals, early successive bilinguals (initial exposure 1 to 3 years old), and child L2 learners (initial exposure 4 to 10 years

old) effectively disappeared. Frequency of use can affect lexical retrieval and processing efficiency. When Hopp (2010) examined knowledge of case, gender, and subject–verb agreement in L2 German by advanced L1 speakers of Dutch, English, and Russian, not only did he find native-like L2 performance in an offline task, but he also found that increasing the speed of an online task for L1 German native speakers (using speeded grammaticality judgements) reduced their processing efficiency such that there were no longer significant differences between L1 and L2 participants. Such findings cast serious doubt on the existence of a critical period for underlying knowledge of syntax.

30.3 PATTERNS OF RETENTION IN CASES OF CHILDHOOD ATTRITION

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In cases of L1/L2 attrition, it does seem clear that there is a dramatic crash in lexical retrieval and syntactic processing ability (in terms of both production and comprehension) if input is ended abruptly sometime before the age of 8 to 12 years (Ammerlaan, 1996; Pallier et al., 2003; Montrul, 2008; Bylund, 2009b). However, it is not clear how the lexicon, phonology, or syntax differentially affect this breakdown, how much is due to disuse rather than CLI, and to what degree lack of real-time processing in test conditions is indicative of a lack of dormant grammatical knowledge.

In contrast with this general picture, several studies have shown that aspects of phonology may be surprisingly robust during periods of childhood attrition. Oh et al. (2009) tested for remnants of phonological knowledge in twelve Korean adoptees in Minnesota enrolled in university-level beginner Korean language classes. Five had no Korean input at all between the age of adoption (<12 months old) and the age of re-exposure, and seven had very minimal input. However, these groups significantly outperformed novice learners in the perception of aspirated consonants and lenition of plain consonants after only two weeks of systematic re-exposure. Additional evidence for the resilience of phonology was obtained in an fMRI neuroimaging study by Pierce et al. (2014) investigating tone perception. Brain activation was monitored during a Chinese lexical tone discrimination task by three groups of French-speaking children in Quebec: (i) Chinese-French bilinguals who spoke Chinese at home and French elsewhere; (ii) monolingual French speakers with no knowledge of Chinese; and (iii) adoptees who had arrived from China at 12 months old and had grown up speaking French with no re-exposure to Chinese. The adoptees could be assumed to have had some knowledge of tone at the age of adoption, as babies show sensitivity to lexical tone contrasts by 4 to 5 months (Yeung et al., 2013). The adoptees (mean age 13;0) performed like the bilinguals, despite the lack of any conscious knowledge of Chinese, and despite an average twelve years of non-exposure following adoption. These findings appear to directly contradict the notion of an age-related critical period in phonological attrition, at least for phonemic contrasts and tone perception.

As for syntax, the most suggestive data available that bears on the proposal of a critical period comes from studies of syntactic knowledge in heritage learners with significant reductions in (though not absence of) L1 input. Montrul (2004a) examined knowledge of null subjects and object clitics in Spanish heritage speakers who had been schooled in

English in the US, and who were attending college classes at the time. Even the lower proficiency heritage language group displayed ‘robust knowledge of the syntax of subjects and objects’ (p. 137), although they did show CLI with regard to pragmatic and semantic features. Montrul (2006) found similar resilience in the syntax of unaccusative and unergative verbs. Montrul (2008) reflects on these results by noting that aspects of syntax are ‘assumed to develop quite early in life, before age 4, and might not be highly dependent on fluctuations in the amount of input or the development of literacy skills during the school years’ (p. 192). At least in cases of reduced input, without the kind of disablement of the lexicon seen in the adoptee studies, aspects of L1 syntax appear to be resistant to attrition.

Studies of older children and adults who have undergone L1 attrition almost invariably show a high degree of retention in syntax (e.g., Schmid, 2002; Keijzer, 2007). In a particularly striking case from Schmid’s study of attrition in thirty-five German Jews who had emigrated to anglophone countries during the Nazi regime, the most strongly attrited immigrant had left at age 13, had not used German for sixty years, and was considered as a non-native speaker by all thirteen native speaker raters. While this person’s speech was characterized by pauses, hesitations, use of mainly high-frequency lexical items, and avoidance of syntactic complexity, she nevertheless achieved accuracy rates of over 99% in case assignment and over 95% in targeted verb phrase phenomena over the course of her 4,500-word interview. As Schmid (2011a) muses: ‘Loss of grammatical competence? I don’t think so!’ (p. 67).² This finding has been reinforced in more recent research on community attrition in speakers of German in the United States. Hopp & Putnam (2015) found that interview data from the moribund heritage dialect of Moundridge Schweitzer German revealed that 245 out of 247 main clauses could be analysed as having the finite verb in second position, an unexpectedly robust accuracy level in the context of a severe decline in conversational fluency.

Interestingly, in all these studies, the phenomena that point to evidence for resilience in phonology and syntax exist in only one of the languages in contact. This suggests that they may escape the effects of attrition because they are not subject to CLI. It remains an open question whether Chinese adoptees whose L2 is a different tone language (e.g., Thai) would still be able to distinguish the L1 tones they had acquired as infants. Where variants of the same phenomena exist in both languages, there is ample evidence for change in the L1 phonological and syntactic systems, in terms of restructuring, convergence, and shift, although these changes may be superficial and ultimately due to problems of cognitive control and an imbalance in language activation (for discussion, see Schmid, 2011a, pp. 49–67).

Most if not all findings that purport to demonstrate changes in L1 syntax with regard to specific syntactic phenomena can be explained in terms of CLI from a dominant L2 to an under-used L1. This suggests the kind of interplay between language systems typical in bilingualism, rather than the erasure of syntactic knowledge from the brain due to disuse. For example, Sorace (2000b) documented how L1 Italian speakers who have become near-

² Schmid calculated these figures on the basis of the observation that the 4,500-word text contained only ten case-assignment errors and twenty-eight verb-phrase errors, while a selected 1,000-word stretch of text was found to contain 274 case-marked elements and 150 verb phrases. These latter figures were multiplied by 4.5 in order to derive approximate totals for the whole interview. Thus the error rates reported in Schmid (2011a, p. 67) were a reasonable estimate of distribution.

native speakers of English no longer have the same distribution of null versus overt subjects as monolingual Italians. Their English-influenced pronoun distribution mirrors that of advanced acquirers of L2 Italian. Tsimpli et al. (2004) found similar discourse patterns in their study of L1 Greek and L1 Italian near-native speakers of English, concluding that while pronoun distribution had been pragmatically conditioned and influenced by the L2, basic syntax remained unaffected. Parallel findings obtain in other areas of syntax, such as pronominal binding. Gürel (2002) found that both acquirers (L1 English learners of Turkish in Istanbul) and attriters (of L1 Turkish in North America) had the same error patterns under the influence of English as the dominant language. In such cases, if there is no qualitative difference between L1 effects on the L2 and L2 effects on the L1, it makes more sense to think in terms of CLI, rather than treating acquisition and attrition as unrelated phenomena.

In more extreme situations of shift to the L2, speakers may end up with a single hybrid system, which is arguably the most convincing analysis for the case of Pablo, as reported by Iverson (2012). Despite late immersion in an L2 Portuguese environment at age 25, Pablo's Chilean Spanish had undergone restructuring, with distinctly Portuguese syntax in areas such as verb–subject word order, overt pronoun use in discourse-neutral contexts, non-overt objects with definite antecedents, interpretation of embedded overt subject pronouns in ambiguous contexts, and relative clause attachment. These fundamental changes in syntax occurred well after any possible critical period for attrition. That what is often called attrition may in fact not be language loss but change due to CLI is recognized as a possibility by Schmid, who notes that

part of the phenomenon which we refer to as 'language attrition' [...] may only be the somewhat more visible tip of the iceberg of L2 influence on L1—something which all bilingual speakers experience, but which has become noticeably pronounced in the speech of some.

(Schmid, 2011a, p. 12)

30.4 RESILIENCE OF PHONOLOGY AND SYNTAX IN L2 ATTRITION

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There is a small but growing body of empirical evidence from L2 attrition research that bears on the questions of resilience of phonology and syntax, and the possible existence of a critical period for attrition. We first review studies of phonology before considering syntax.

30.4.1 Attrition in L2 phonology

Although few studies specifically target L2 phonological attrition, several researchers have included phonological observations in the course of more general analysis. For example, in a study of a child who had returned to Japan after having lived in the US for seven years from 1;3 to 8;0, Tomiyama (1999a) observed only four instances of mispronunciation in production data from a variety of tasks over eighteen months. In other studies, such as Murtagh (2003) and Murtagh and Slik (2004), phonological data were elicited by means of

a reading task, but scores for pronunciation were then combined in a general speaking test score, obscuring specific evidence for phonology.

Three studies stand out as more systematic investigations of L2 attrition in phonology, all involving students of French. Weltens (1989), Dugas (1999), and Engstler (2012) employed experimental designs familiar from laboratory phonology studies of L2 acquisition. Weltens (1989) examined attrition in fifty-three Dutch students who had taken French for either four or six years at school, testing to establish a baseline after the period of instruction, and then after two years and four years of non-use. There was virtually no change in the scores in either a phoneme discrimination task or a reading task, indicating robust retention of phonology. In a written phonology test, however, the category of contrasting oppositions of nasal vowels, as in *en-on*, *tendu-tondu*, and *répand-répond*, was subject to attrition. Given that the test presented real rather than nonce words, this finding may be understood in the light of work by Darcy et al. (2012), which allows for the possibility of encoding of such challenging oppositions as lexical contrasts, such that the contrasts might never have been fully integrated into the phonological system.³ In such cases, lexical-phonetic representations might attrite, rather than the phonological system itself.

Dugas (1999) followed L1 English learners of L2 French who had studied in France and returned to the US. She examined the accuracy in production of four phonemes that do not occur in English: nasalized /ɛ/, /ɑ/, /ɔ/, and rounded /y/; and three phonemes that have English correlates: /u/, /e/, and /o/. A total of forty students completed a picture-naming baseline test within three weeks of leaving France, and another eleven months later. Dugas reported only 'modest' or 'cosmetic' attrition that did not affect comprehensibility (p. 138). Overall, 40% of students showed some reduction in accuracy, 30% showed no change, and 30% improved somewhat between the baseline and the subsequent test. The new phonemes showed reduced accuracy scores, leading Dugas to conjecture that they might be undergoing attrition (p. 101). As with the findings of Weltens (1989), this may be interpreted in terms of initial lexical encoding of nasal vowel contrasts.

Engstler (2012) also examined phonological attrition in American university students returning from study abroad in France. She examined seven phonemic contrasts, two consonant contrasts (t-d; n-ŋ), and five vowel contrasts (u-y; œ-y; ε-ē; o-ō). Nine of the seventeen students continued French instruction following their return and eight did not. A phoneme discrimination task (an AX task) and a lexical decision task were conducted at two months (baseline) and at five and nine months. The students with no continued instruction showed no appreciable decline in their discrimination scores from two to five months, while students enrolled in French classes improved. Both L2 groups showed improved reaction times in contrast to monolingual controls, and at nine months, were still faster than at two months. In the lexical decision task, the non-instructed group maintained their scores at five months, showing no attrition, while the group with continued instruction improved. After nine months, there was no difference between the groups; the instructed group lost its initial advantage during summer vacation, but did not lose its study abroad gains.

³ An example of direct mapping from acoustics to the lexicon in English would be pronunciation of the name *Bach* with a voiceless velar fricative. Even highly consistent pronunciation of this lexical item in this way by a monolingual speaker of English would not mean that /x/ had been incorporated into the phonological system.

Overall, these findings appear to be commensurate with those in L1 attrition research, in that attrition in L2 phonology was minimal. They do not address the issue of a critical period, as onset of attrition was in adolescence, other than in the case of Tomiyama's (1999a) participant, who was on the cusp of the proposed transition. It is important to recall, however, that a critical period around ages 8 to 10 has no particular status in any specialized study of phonological acquisition.

30.4.2 Attrition in L2 syntax

In comparison to the modest number of studies in phonology, the number of studies that address issues in syntax seems larger, but a closer analysis reveals that very few combine both judicious attritional design and careful syntactic analysis. In several cases, a meticulous design is used to address more general questions; in others, methodological problems undermine sophisticated analysis. It is possible to divide syntactic attrition studies into three types: those that address syntax as part of a general description of L2 attrition without detailed investigation, those that measure attrition in terms of degree of complexity (clauses per T-unit), and those that address a single area of L2 syntax.

Syntax as compared to other domains. L2 attrition studies that compare syntax to other linguistic domains have not often investigated syntax in detail, but generally report that syntax shows less attrition than morphology or the lexicon (usually understood in terms of open-class vocabulary). Kuhberg (1992) followed two children, ages 7 and 9, for fifteen and twenty months, respectively, both of whom had returned to Turkey from Germany. Syntactic data came from conversations and informal interviews rather than specific targeted structures. Kuhberg found that syntax in general was less vulnerable to attrition than vocabulary.

Tomiyama's (1999a) general linguistic analysis of a Japanese child returnee (discussed above in terms of phonology) found resilience in the receptive lexicon, but early attrition in lexical retrieval for production, with some indication of attrition in morphology and syntax. (See Taura, Chapter 32, this volume, for a general review of attrition studies focusing on Japanese returnees.) In a second study of the same child, Tomiyama (2000) investigated attrition from twenty to thirty-three months after return. She reported changes in syntax and morphology, but stability in vocabulary. An examination of the raw data suggests caution in interpreting the conclusion of attrition in morpho-syntax. The decrease in accuracy with plurals in month 17 was only from 6/6 (100%) to 5/6 (83%), and the 'less than perfect accuracy' in use of irregular past in the storytelling data was due to scores of 22/24 (91%) in Month 27, 24/26 (92%) in month 31, and 14/15 (88%) in month 33. Performance on grammatical morphemes overall was extremely accurate across tasks involving picture description, storytelling, and conversation, usually hovering around 100%. It seems possible that the decline in syntactic fluency reported in this study (pauses, hesitations, self-repairs), and problems with relative clauses might have both been due to difficulties in lexical retrieval.

Syntax as complexity. A second set of studies focuses on syntax from the point of view of complexity.⁴ Of the three studies we consider in this category, only one investigated

⁴ In this review we separate complexity from accuracy by considering measures of clause depth only, not word length or error-free word length.

attrition in child learners. Tomiyama (2009) conducted a longitudinal study of two siblings who moved from Japan to the US aged 2;8 and 5;8, and returned to Japan aged 7;0 and 10;0. Their language skills were assessed from four to thirty-one months after their return. Grammatical complexity (clauses/T-unit) and grammatical accuracy (error-free clauses per T-unit) were computed. The older sibling maintained both complexity and accuracy, whereas the younger sibling maintained complexity but showed a decline in accuracy. While Tomiyama suggests that age may be relevant, this is difficult to separate from a difference in personality, as the younger child's quiet and hesitant nature may have affected speed of lexical retrieval, pauses, and hesitations, and thus her syntactic fluency.

Exploring whether attriters would show a decrease in syntactic variety over time, Russell (1999) measured clauses/T-unit and number of different subordinate clause types in a population of college-age missionaries who had returned to the US after two years in Japan. Data collected at three points over two-years indicated a decline in the total number of clauses, but no significant change when adjusted for T-units. Variety in the number of subordinate clause types showed a significant decline in the no-instruction group and an increase in the instruction group. A subset of these learners was retested after ten years; there was a continued decline in clauses/T-unit for the uninstructed group, but the instructed group showed no change (Russell, 2012). Subordinate clause variety decreased dramatically without instruction, but less precipitously with instruction.

Nagasawa (1999) reports variation in attrition of complexity in similar missionary returnees. Using a ratio of simple sentences/T unit, two of the seven participants in her study show an increase in simple sentences (a decrease in complexity) and five show a decrease in simple sentences (an increase in complexity). Using words/T-unit as an indirect measure of syntactic complexity, Nagasawa reported that five participants decreased the number of words/T-unit and two showed an increase. In a combined measure of 'sentence structure and embeddedness and T-Unit length', Nagasawa counted attrition for three participants, retention for three, and improvement for one. These results resist clear interpretation. Evaluating knowledge of syntax by means of measuring complexity in real-time production is complicated by issues of lexical representation, lexical access, and hesitation fuelled either by processing difficulty or by lack of confidence, all of which can impinge upon computations in working memory. We return to this issue in the discussion.

Focal syntactic studies. We now consider studies that parallel second language acquisition studies of syntax, in that they investigate a single aspect of syntax in some detail. The range of topics in such studies includes object deletion, null subjects, binding, noun-modification, and verb placement.

McCormack (2001) investigated binding in L2 English using a truth value task and a grammaticality judgement task. The participants were six Japanese adults who had studied in the US as third-year college students, half of whom had also lived in the US as children for three to eight years, returning by age 13. All participants demonstrated high levels of global proficiency with TOEFL (Test of English as a Foreign Language) scores ranging from mid-500s to mid-600s. Results from the two tasks were well-aligned: three individuals showed retention, while three showed decline. However, influence of early acquisition was less clear: the retention group included two child returnees and one older learner, and the attrition group included two older learners and one child returnee. Two of the study's hypotheses were supported: (i) Binding Principle A (reflexive binding) appeared to undergo change when contact ended, but (ii) such change was UG-constrained. The third

hypothesis, that retention would correlate with age of first exposure, was not entirely supported: On McCormack's (2001) account, factors other than age contributed, including motivation. However, the highest scoring returnee was also the youngest child learner with the longest childhood stay in the US; in comparison, the lowest scoring child returnee had less than half the childhood exposure to English.

Like McCormack, Flores (2010, 2014) tested returnees as adults. Flores (2010) analysed finite verb placement in subject-final V2 structures in matrix clauses, and verb-final structures in subordinate clauses and complex verb phrases, using data from oral production tasks that comprised conversational interviews, current events, narrative retells, and picture description. The participants included seventeen emigrants, aged 7 to 36 years at the time of elicitation, all of whom were either born in Germany or Switzerland or had moved there before the age of 3, and who had subsequently moved (back) to Portugal, where exposure to German was minimal. Thus this study is perhaps better characterized in terms of attrition in bilinguals rather than a clear-cut case of L2 attrition. Group 1 (child returnees) comprised those who returned to Portugal aged 7 to 11 years old, while those in Group 2 (teenage returnees) had returned aged 12 to 14. Group 1 showed significant variation in V2 production, ranging from 11.5% to 75% accuracy, whereas Group 2 participants were highly accurate (93–100%), regardless of length of stay. Flores concludes that while other factors not assessed, such as motivation, aptitude, and emotional investment, might have played a role, 'age of return seems to be a decisive factor leading to unstable linguistic competence' (p. 543). Flores concluded with two interesting points: Some child returnees scored much better on matrix V2 than on subordinate OV and others did the reverse, showing that manifestations of syntactic attrition were not uniform. Second, she cautioned that even with 50% non-target-like production, the child returnees also demonstrated 50% target-like production. Syntax was not completely lost, not even for subjects who voiced concerns before the interview that they might no longer be able to speak German at all.

Flores (2014) investigated verb placement and object drop in the same two groups defined by age of return. Direct object omission is a property of European Portuguese and may occur when the object is a topic and recoverable from discourse. German exhibits similar but far more restricted topic-drop than Portuguese. The child and teenage returnees did not differ significantly with regard to object expression, both showing non-target-like uses of object drop (47.3% and 34.4%, respectively). In contrast to verb placement, which was variable in the child returnees but stable in the older children, the variability of object-drop in both groups suggests that it is only maintained through continued contact with German. This leads Flores to consider that there is a difference in vulnerability between narrow syntax and properties at the syntax–discourse interface. Narrow syntax is more likely to experience attrition if input is reduced before the age of 11 or 12, but is otherwise stable. She concludes that the syntactic domain is 'primarily constrained by maturational factors' whereas properties at the syntax–discourse interface are 'more permeable to input reduction' (p. 565).

Flores (2015a) conducted a case study of an individual child with the same general language profile, examining oral and written production in the early stages of return. The child was in Germany for seven years, from age 1;7 to 9;5, attending kindergarten through third Grade. She was tested four times after her return, over a period of eighteen months. At month 13, 43% of the sentences were non-target-like with respect to verb placement.

Subject expression showed an increase in ungrammatical omission (from 0% to 13%). Syntax appeared to be resilient when contrasted with case, gender marking, and verb morphology. All analysed linguistic domains showed some decline, although just as in the earlier studies, knowledge is always retained, and attrition is never complete.

Kang (2013) provides an individual case study of an L1 Korean–L2 English child who spent two years in the US from age 9;10 to 11;10, based on data from Kang (2011). He was tested on return fifteen times over a span of thirteen months via two production tasks targeting irregular past tense and passives (p. 224); the examples suggest that the target sentences in the irregular past tense production task were active, and that the target sentences in the passive production task were past and regular. Overuse of null subjects in L2 English was not anticipated but appeared in the data. Null subjects began to appear in the fourth session, and became dominant after the sixth session, in spite of continued EFL (English as a Foreign Language) instruction. Null subjects were used more frequently in passive sentences (82.4%) than in active sentences with irregular past (49.3%). These are the kind of discourse-conditioned distributional errors discussed earlier, as reported by Montrul (2004a).

Among other syntax-oriented studies, several have promised interesting findings but could not provide insight into the issues raised here due to problems in research design. Such reports serve more as springboards for future research. For example, in one early study, Jordens et al. (1989) investigated attrition in case marking and found some resilience, but the period was arguably too short for any attrition effects to have emerged. In a more recent study, Snape, et al. (2014) raise intriguing questions about attrition in the L2 English article system with respect to generics, eliciting judgement data from four Japanese child returnees who had spent eight to twelve years in the US. Their questions are framed in an insightful linguistic analysis, but after testing participants at two and six months during the attrition period, they concluded that the relevant aspects of syntax had never been fully acquired; therefore attrition could not be systematically tested.

To be able to address the research questions posed here, several factors must be considered in the study design: a modular approach to language, such that claims of general ‘language attrition’ do not subsume linguistic domains with very different patterns of acquisition and attrition; a linguistic analysis of the phenomenon; a baseline constituting a peak of acquisition against which to measure attrition; a range of onsets in acquisition with participants from before and after the proposed critical period of 8 to 10 years old; and there must be control for any re-exposure during the period of attrition. No single study has all these elements in place, but the preceding review allows us to combine findings and offer some insights and emerging generalizations.

30.5 DISCUSSION: DISENTANGLING SYNTAX AND PHONOLOGY FROM LEXICAL ATTRITION

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We may now return to the research question guiding this review of empirical findings in L2 grammatical attrition: Are phonology and syntax resilient to attrition, either before or after a critical period? In the case of L2 phonology, despite a paucity of targeted investigations,

evidence from studies such as Weltens (1989), Dugas (1999), and Engstler (2012) supports the emerging picture from L1 attrition research of remarkable resilience in this domain. Aspects of phonology may even be immune to attrition if there is no conflict with the other language. However, phonological change might be expected in at least two scenarios. If particular sounds are encoded only at the lexical level (as suggested by Darcy et al., 2009), rather than being incorporated into the phonological system, pronunciation will suffer from lexical attrition. This may help explain findings regarding attrition of French nasal vowels (Weltens, 1989; Dugas, 1999), though further research is necessary. In addition, change is likely in cases of CLI. Schmid (2011a, pp. 49–53) extends Pavlenko's (2004) framework for lexical CLI to the phonological system, documenting convincing examples of L1 restructuring, convergence, and shift. The majority of perceived L2 phonological attrition may not be due to linguistic memory loss (what Schmid, 2011a, p. 5, calls 'attrition proper'), but rather to the kind of transfer from the dominant language that is evident in acquisition as well as attrition.

Modular L2 syntactic knowledge may be similarly impervious to attrition, but as yet there is no hard evidence to suggest this, as knowledge of syntax is difficult to separate from lexical semantics, real-time processing constraints, and discourse factors. For example, in the area of binding principles, McCormack (2001) did find some attrition, but Principle A is dependent on lexical encoding. Universally, simplex anaphors like Japanese *zibun* 'self' are unbound locally and subject-oriented. Complex anaphors like Japanese *jibun jishin* 'self own-self' or English *himself* are bound locally and are not strictly subject-oriented (Reinhart & Reuland, 1991). It is possible that syntactic principles of binding remain in place, but particular complex anaphors might be treated holistically by some acquirers and attriters. CLI in pronominal binding was found by Gürel (2002) both in L2 acquisition and in L1 attrition, but the study concerned two pronouns in Turkish, each of which had different binding properties and different patterns of CLI, again implicating the lexicon.

Studies examining reductions in L2 syntactic complexity (Nagasawa, 1999; Russell, 1999, 2012; Tomiyama, 2009), are clouded by that fact that any failure or delay in recalling either open- or closed-class morphemes can cause syntactic processing to break down if computations cannot be completed within the limitations of working memory. In such cases, simplification and reliance on main clauses are to be expected. Lexical attrition can thus cause an apparent reduction in syntactic complexity. Moreover, decreases in complementation variety of the type discussed by Russell (1999, 2012) also involve lexical encoding. Types of subordinate clauses are subcategorized by the predicate (e.g., the verb *start* selects either a gerund or an infinitive, whereas *stop* selects only a gerund; the complementizer *whether* selects either a finite or non-finite complement, whereas *if* selects only a finite clause), so errors in this domain may involve a loosening of subcategorization restrictions.

Thus, to the degree that L2 syntax depends on lexical semantic representations or discourse factors, it appears to be subject to attrition. In addition, as testing for it usually involves real-time processing, assessment is complicated by lack of automaticity in lexical retrieval (see, e.g., Mehotcheva, 2010.) Cases of 'pure syntax' are hard to find (for further discussion, see Montrul, 2011b). Of the L2 studies in this review, perhaps the closest to examining extra-lexical syntactic principles was Flores (2010), who found significant variation in productive accuracy in the domain of V2 syntax on the part of attriting child bilinguals, in contrast to teenage bilinguals, who showed resilience. However, given that V2 involves long-distance dependencies that must be calculated within seconds while traces

are still active, it is also possible that here too, lexical access is implicated. In summary, the evidence for the resilience of grammar is somewhat different for phonology and syntax. Both L1 and L2 phonology show resilience in general, but are subject to CLI when systems overlap. As for syntax, it proves more difficult to argue for resilience in the absence of CLI, as neither comprehension nor production of syntax can be examined independently of lexical retrieval and the real-time constraints of working memory.

Perhaps the most surprising implication of this investigation concerns the question of what happens in middle childhood such that catastrophic loss of either L1 or L2 knowledge can follow a loss of input. What is the meaning of the 'X marks the spot' phenomenon in Montrul's (2008, p. 266) intriguing graph, at the intersection of the downward line showing decline in L2 acquisition and the upward line showing retention in L1/L2 attrition? We answer this with a hypothesis. There is very little evidence to support a critical period in either phonology or syntax, but it seems entirely plausible that a critical period for L1/L2 attrition involves a stabilization of the network of the mental lexicon at around 8 to 10 years of age. In L2 acquisition, this would mean continued CLI from the L1 lexicon after this age even in cases of full immersion, on the assumption of Full Lexical Transfer (Sprouse, 2006; Stringer, 2010). As regards L1/L2 attrition, any prolonged period of disuse in advance of a developmentally determined stabilization of the lexicon would have a devastating effect on both receptive and productive syntactic processing. The lexicon is at the heart of much current syntactic theory, such that the acquisition of L2 syntax involves the reassembly of grammatically relevant features on analogous lexical items (e.g., Lardiere, 2009). On this account, we might expect lexical attrition to directly affect underlying syntactic knowledge as well as syntactic processing, and any lexical (though not extra-lexical) aspects of phonology. It is notable that there are no reports in the literature—not even anecdotal reports—of the phenomenon of language coming 'flooding back' in cases of re-immersion for young children, in contrast to this well-recognized phenomenon in adults (Meara, 2005; Bardovi-Harlig & Stringer, 2013). However, as we noted earlier, no L2 attrition study to date controls for age in such a way to truly test for a critical period. More systematic, linguistically informed research is necessary to establish a definitive account of how loss, retention and activation of the mental lexicon relate to phonology and syntax in cases of L2 attrition.